CLAIMS

What is claimed is:

1. A method for forming a semiconductor device, the method comprising:
defining a sacrificial layer over a single crystalline substrate;
implanting said sacrificial layer with a dopant species in a manner that prevents said single crystalline substrate from becoming substantially amorphized; and
annealing said sacrificial layer so as to drive said dopant species from said sacrificial layer into said single crystalline substrate.

2. The method of claim 1, wherein said sacrificial layer is a dielectric layer further comprising at least one of: an oxide layer, a nitride layer, and an oxynitride layer.

3. The method of claim 1, further comprising forming a halo implant, wherein, in addition to said dopant species, said sacrificial layer is further implanted with a damage creating species prior to annealing of said sacrificial layer.

4. The method of claim 3, wherein said damage creating species further comprises at least one of: silicon, germanium, indium, fluorine, and a noble gas.

5. The method of claim 3, further comprising forming an extension implant using said sacrificial layer.

6. The method of claim 5, wherein annealing for said halo implant is implemented at a greater temperature and for a longer duration then for said extension implant.

7. The method of claim 1, wherein said sacrificial layer further comprises an oxide layer formed over a silicon substrate, said oxide layer formed at a thickness of about 15 to about 100 angstroms.

8. The method of claim 7, wherein an implantation energy of said dopant species is selected so as to locate a peak concentration of said dopant species at about a middle of said oxide layer.

9. The method of claim 1, wherein said single crystalline substrate further comprises a silicon region of an silicon-on-insulator (SOI) device having a silicon thickness of less than about 100 angstroms.

10. The method of claim 1, wherein said single crystalline substrate further comprises a silicon region of a field effect transistor (FET) device having a thickness of less than about 200 angstroms.

11. The method of claim 1, further comprising:
defining said sacrificial layer over a patterned gate stack formed on said single crystalline substrate;
forming a halo implant by said implanting said sacrificial layer and said annealing said sacrificial layer; and
forming an extension implant by additional implanting and annealing of said sacrificial layer.

12. The method of claim 11, wherein said sacrificial layer is a dielectric layer further comprising at least one of: an oxide layer, a nitride layer, and an oxynitride layer.

13. The method of claim 12, wherein during formation of said halo implant, in addition to said dopant species, said sacrificial layer is further implanted with a damage creating species prior to annealing of said sacrificial layer.

14. The method of claim 13, wherein said damage creating species further comprises at least one of: silicon, germanium, indium, fluorine, and a noble gas.

15. The method of claim 13, wherein annealing for said halo implant is implemented at a greater temperature and for a longer duration then for said extension implant.

16. The method of claim 12, wherein said sacrificial layer further comprises an oxide layer formed over a silicon substrate, said oxide layer formed at a thickness of about 15 to about 100 angstroms.

17. The method of claim 16, wherein an implantation energy of said dopant species is selected so as to locate a peak concentration of said dopant species at about a middle of said oxide layer.

18. The method of claim 11, wherein said single crystalline substrate further comprises a silicon region of an silicon-on-insulator (SOI) device having a silicon thickness of less than about 100 angstroms.

19. The method of claim 11, wherein said single crystalline substrate further comprises a silicon region of a field effect transistor (FET) device having a thickness of less than about 200 angstroms.

20. The method of claim 11, wherein said dopant species comprises at least one of: arsenic (As), phosphorus (P), antimony (Sb), boron (B) and boron fluorine (BF_2).